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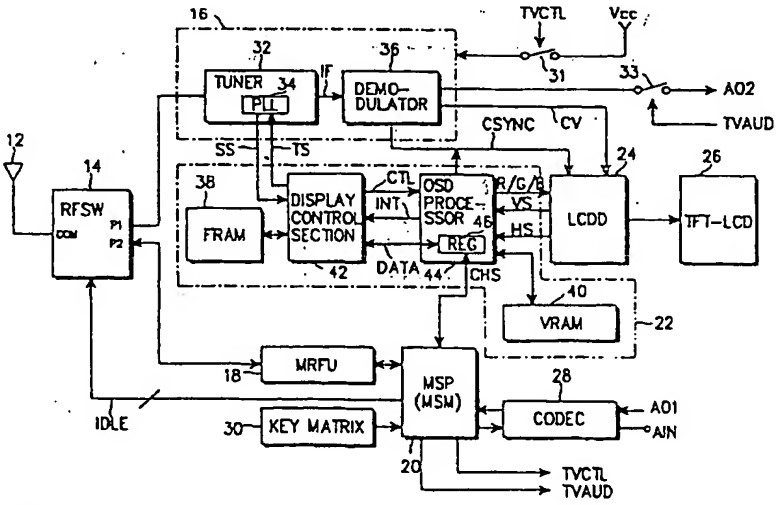
(54) Abstract Title
Portable television phone

(57) A cellular phone is integrally combined with a broadcast TV receiver and display. A single antenna 12 receives phone and TV signals and passes them via an RF switch 14 to a TV module 16 and phone receiver 20 in TV mode or to the phone receiver 20 alone, in phone mode. The module 16 decodes the TV signal and produces video and synch and for the display 26 and audio signals AO2. In TV mode, if an incoming call is received, the phone receiver 20 signals a TV control unit 22 which operates on the TV display to notify the user of a call. Depending on the mode of notification, the TV may be switched off at power supply switch 31, or the audio muted for a specified time. Alternatively, a text message and/or icon stored in memory 38 may be inserted into the TV picture signals.

FIG. 1



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

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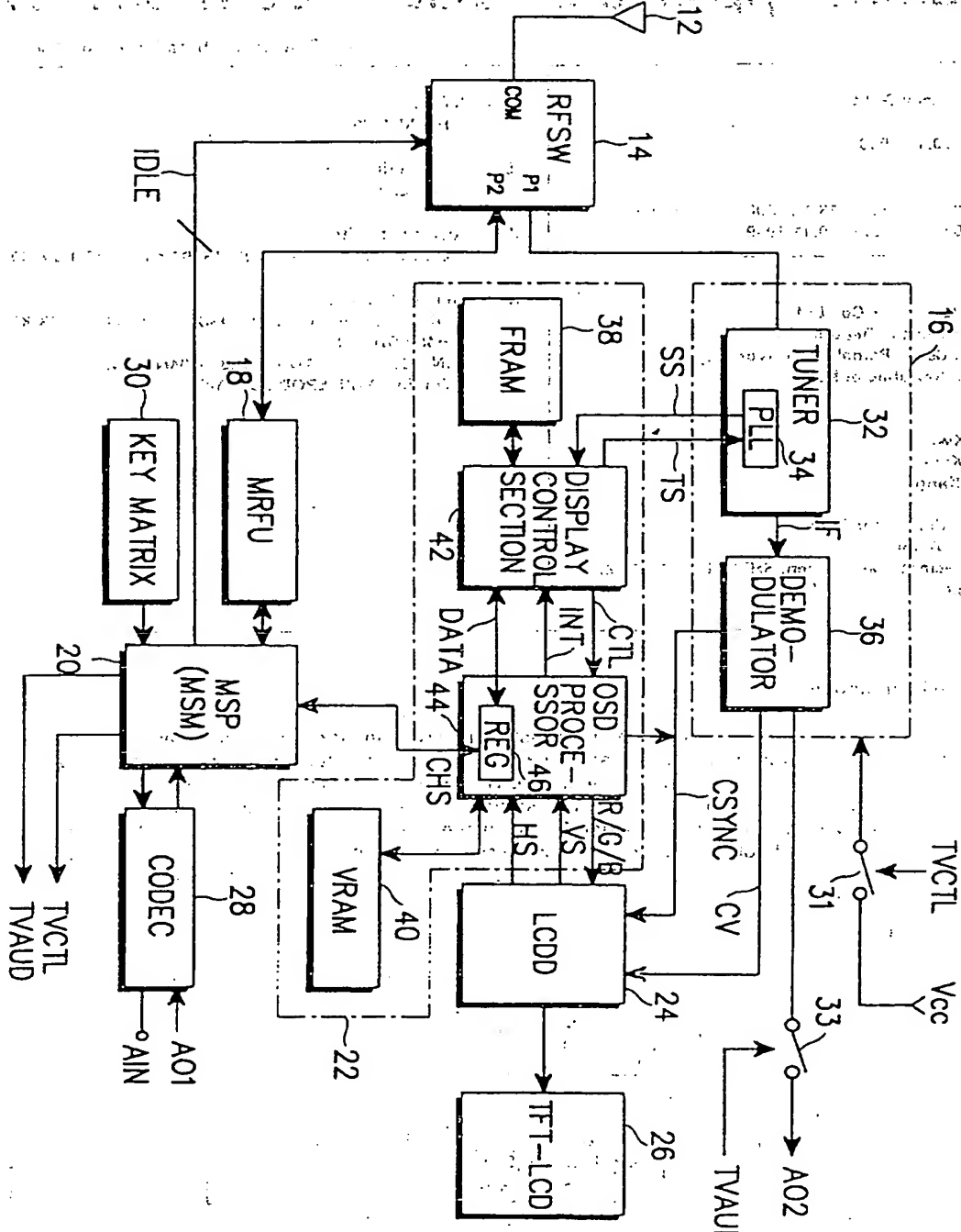
FIG. 1


12
RFSW
COM
P1
P2
14
IDLE
16
TUNER
PLL
34
32
SS
TS
IF
DEMO-
DULATOR
36
FRAM
38
18
30
KEY MATRIX
MRFU
DISPLAY
CONTROL
SECTION
42
DATA
INT
CTL
20
MSP
(MSM)
OSD
PROCE-
SSOR
46
REG
44
CHS
R/G/B
HS
VS
CSYNC
CV
TVCTL
31
Vcc
33
CODEC
28
VRAM
40
LCDD
24
22
TVCTL
TVAUD
AIN
AO1
TFT-LCD
26
TVAUD
AO2

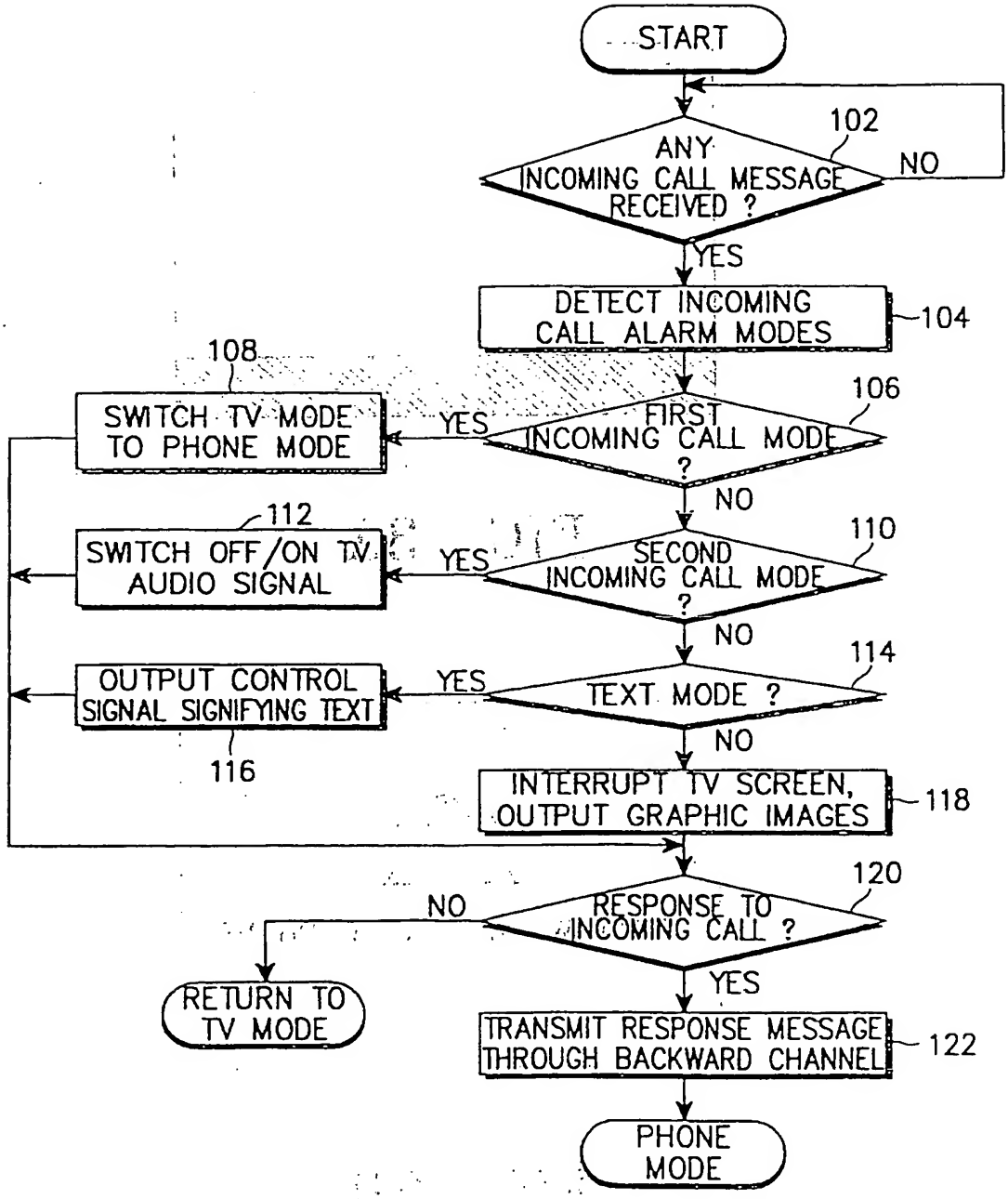

START
ANY INCOMING CALL MESSAGE RECEIVED ?
102
NO
YES
DETECT INCOMING CALL ALARM MODES
104
FIRST INCOMING CALL MODE ?
106
YES
SWITCH TV MODE TO PHONE MODE
108
NO
SECOND INCOMING CALL MODE ?
110
YES
SWITCH OFF/ON TV AUDIO SIGNAL
112
NO
TEXT MODE ?
114
YES
OUTPUT CONTROL SIGNAL SIGNIFYING TEXT
116
NO
INTERRUPT TV SCREEN, OUTPUT GRAPHIC IMAGES
118
RESPONSE TO INCOMING CALL ?
120
NO
YES
RETURN TO TV MODE
TRANSMIT RESPONSE MESSAGE THROUGH BACKWARD CHANNEL
122
PHONE MODE

FIG. 2

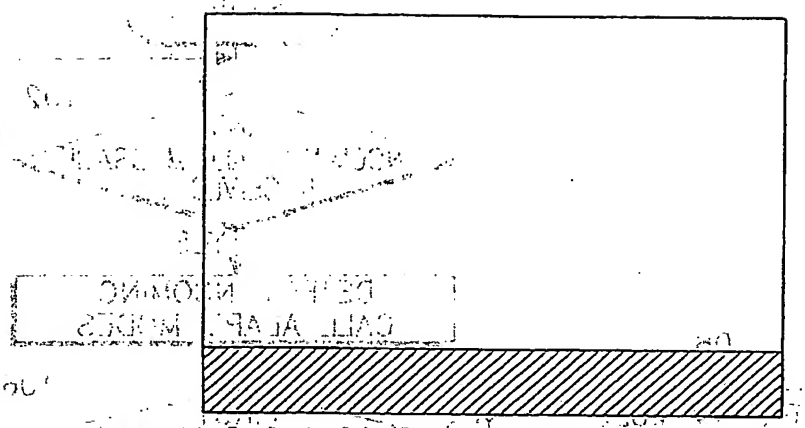


FIG. 3A

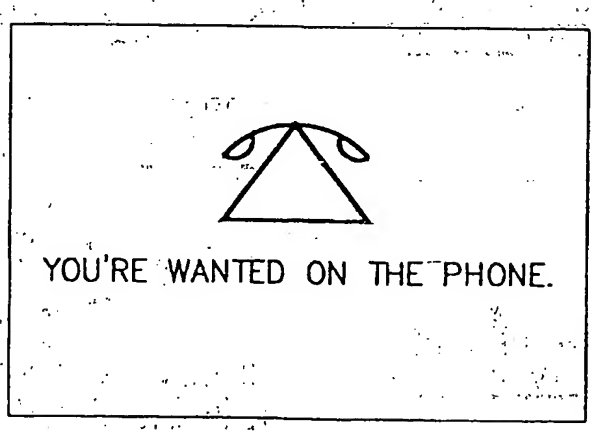


FIG. 3B

PORTABLE TELEVISION PHONE

The present invention relates to a hand-held portable cellular telephone, and more particularly to an integrally combined television (TV) and portable cellular phone (hereinafter, referred to as "TV phone").

In recent years, rapid and wide spread use of portable cellular telephones as an ordinary personal communication appliance in society has driven the desire of users toward development of the portable phone with a variety of additional functions besides a simple conversation function. For example, such a portable phone has been developed having a calculating function, a biorhythm checking function, and other functions capable of transmitting/receiving images of a TV and a video camera additionally included therein. The term "TV phone" herein refers to wireless portable cellular phones of all types which allow for watching a television (TV) broadcast program through a displaying unit of the portable phone in addition to a cordless telephone conversation function for telecommunication.

For the above reception function of a TV broadcast, the portable phone should be equipped with two radio frequency units therein. The reason for this is that a frequency bandwidth necessary for transmitting/receiving inherent messages (i.e., audio and data) for the portable phone is

different to that for a TV broadcast. The operational modes of a TV phone include a phone mode and a waiting mode for voice and data communication and TV mode for TV reception

In addition, because the TV phone should allow a user to watch and hear images and audio of a television broadcast program received in the TV mode through a display unit, i.e. a Thin Film Transistor (TFT) Liquid Crystal Display (LCD), and a speaker or an earphone of the portable phone, it should be distinguished from a general portable phone in a manner allowing a user to be informed of an incoming call and an incoming character message while in the TV mode state.

That is, there is no method of immediately informing the user of the occurrence of an incoming call and/or an incoming character data message when the incoming call or character data message occurs simultaneously with the output of received TV image and audio data.

There is therefore a need in the art for a portable TV phone that more rapidly and accurately informs a user of an incoming of a call and/or incoming character data message when viewing any TV broadcast program in a TV mode.

An example of a TV phone such as that described above is disclosed in Korean Patent Application No.95-46026, filed on December 1, 1995(published on July 31, 1997), entitled "A

COMBINED TV RECEIVER AND CELLULAR PHONE" of LG Electronics Inc. However, the prior art TV phone discloses a technology for controlling separately the operations of a transmitter/receiver of a cellular phone and a TV receiver by using only a microprocessor, but not a technology for processing a character message such as SMS. Also, it is impossible to switch between operational modes in response to notification of incoming call during the viewing of a TV broadcast program in a TV mode. Accordingly, when an incoming call occurs during the watching of a TV broadcast, the transmitter/receiver of a cellular phone is operated separately thereby increasing power consumption of a battery, and creating the inconvenience of having to switch from TV mode to phone mode to determine whether or not any voice or data messages have been received. That is, a user suffers inconvenience by having to switch off the TV and a to switch over from the TV mode to the phone mode.

Accordingly, the present invention provides a TV phone in which a television and a portable cellular phone are integrally combined, the TV phone comprising:

a TV module for receiving and demodulating a desired TV channel signal selected from received radio-frequency electromagnetic signals in response to input of a tuning signal when the TV module operates by supply of a power supply voltage, to generate a composite video signal, a composite synchronizing signal and a composite audio signal;

a Mobile Station Radio Frequency Unit (MRFU) for

demodulating a signal indicative of an incoming call received through a forward channel for forming an audio conversion channel of the received radio-frequency electromagnetic signals and to output the demodulated signal, and modulating and transmitting a signal of a reverse channel;

a TV control section for supplying the tuning signal corresponding to a channel selection command signal to the TV module, the TV control section synchronizing On Screen Display (OSD) data corresponding to display control data and display data such as an icon with the composite synchronizing signal to output the synchronized signal as a video signal;

a Mobile Station Processor (MSP) for establishing a phone mode/TV mode in response to an input command, generating the channel selection command signal stored in a predetermined memory area by setting the TV mode, supplying the display control data to the TV control section according to a preset incoming call alarm mode when receiving an incoming signal from the MRFU or interrupting a power supply voltage supplied to the TV module, and processing audio data outputted from the MRFU to output the processed audio data signal while supplying an audio data inputted to the MRFU; and

a display unit for synchronizing the composite video signal and graphic video signal output from the TV module and the TV control section with the composite synchronizing signal and displaying the synchronized composite video signal and graphic video signal on a image viewing screen.

Advantageously, embodiments of the present invention provide a portable TV phone designed to selectively allow for transmission/reception of an audio and reception of a TV program; which effectively informs a user i.e., a called party of the reception of any incoming call related message when the user receives the incoming call related message from a calling party; and/or a portable TV phone which automatically activates preset incoming call alarm modes when an operation mode of the TV phone is switched from a phone mode to a TV mode.

In accordance with one embodiment of the present invention, there is provided a TV phone in which a television and a portable cellular phone are integrally combined, the TV phone comprising:

a TV module for receiving and demodulating a desired TV channel signal among radio-frequency electromagnetic signals received in response to an input of a tuning signal when the TV module operates by supply of a power supply voltage, to generate a composite video signal, a composite synchronizing signal and a composite audio signal;

a Mobile Station Radio Frequency Unit, (hereinafter, referred to as "MRFU"), for demodulating a signal indicative of an incoming call received through a forward channel for forming an audio conversion channel among the received radio-frequency electromagnetic signals to output the demodulated signal to outside, and modulating and transmitting a signal of a backward channel;

a TV control section for supplying the tuning signal corresponding to a channel selection command signal to the TV module, the TV control section synchronizing On Screen Display (OSD) data such as a font, a graphic etc., corresponding to display control data and display data such as an icon with the composite synchronizing signal to output the synchronized signal as a video signal;

a Mobile Station Processor, (hereinafter, referred to as "MSP") for establishing a phone mode/TV mode in response to an input command, generating the channel selection command signal stored in a predetermined memory area by setting the TV mode, supplying the display control data to the TV control section according to a preset incoming call alarm mode when receiving an incoming signal from the MRFU or interrupting a power supply voltage supplied to the TV module, and processing audio data outputted from the MRFU to output the processed audio data signal while supplying an audio data inputted to the MRFU; and

a display unit for synchronizing the composite video signal and graphic video signal outputted from the TV module and the TV control section with the composite synchronizing signal and displaying the synchronized composite video signal and graphic video signal on a image viewing screen.

An alarm mode of an incoming call of the TV phone constructed in accordance with the principle of the present invention includes a first incoming call mode for interrupting a power supply and switching an operation mode from a TV mode

to a phone mode, a second incoming call mode for switching a TV audio outputted from the TV module, and a third incoming call mode for displaying an incoming call character message or a preset graphic at a specific region on a TV image displaying screen. The MSP is adapted to selectively control output of the audio signal and the video signal by controlling the TV tuner and the TV control section based on a preset incoming call alarm mode of the first to the third incoming call modes in response to an incoming call, or control the OSD to allow the incoming call character message to be displayed at a specific region on the TV image displaying screen.

These first to third incoming call modes represent a bell mode, a vibration mode, and a lamp mode, respectively, when the operation mode of the TV phone is in a phone mode, and are automatically switched from the phone mode to a TV mode.

Embodiments of the present invention will now be described by way of example oonly with reference to the accompanying drawings in which:

figure 1 is a block diagram illustrating the construction of a TV phone according to a preferred embodiment of the present invention;

figure 2 is a flowchart illustrating the process of displaying an incoming call message of the TV phone according to a preferred embodiment of the present invention; and

Figures 3a and 3b are schematic views illustrating a

state in which the incoming call message is displayed on a screen of a display unit of the TV phone according to a preferred embodiment of the present invention.

Reference will now be made in greater detail to the preferred embodiments of the present invention. In the following description of the present invention, only portions necessary for understanding the operation of the present invention are set forth, and a detailed description of known functions and configurations incorporated herein will be omitted when it may make the subject matter of the present invention rather unclear.

Figure 1 is a block diagram illustrating the internal construction of a TV phone according to a preferred embodiment of the present invention.

In Figure 1, a reference numeral 18 designates an MRFU, a reference numeral 20 designates an MSP, and a reference numeral 30 designates an order keypad of a portable phone module, respectively. These components are incorporated in circuits applied to conventional portable digital cellular phones, e.g., CDMA type portable cellular phone, to implement the present invention. The constructions and operations of the above components will be apparently understood by reference to the following detailed description.

Also, a reference numeral 14 designates an RFSW, a reference numeral 16 designates a TV module, a reference numeral 22 designates a TV control section, a reference numeral 24 designates an LCDD, and a reference numeral 26 designates a TFT-LCD, respectively.

The RFSW 14 has a circuit for switching an antenna 12 connected to a common terminal COM to a first port P1 and a second port P2 or only the second port P2 included therein.

That is, the RFSW 14 includes a first port P1 connected to the TV module 16 and a second port P2 connected to the MRFU 18. The RFSW 14 allows the second port P2 to be connected to an antenna 12 in response to an input of a control signal IDLE of a logic "low" state and the first port P1 and the second port P2 to be connected to the antenna 12 in response to an input of a control signal IDLE of a logic "high" state. In an embodiment, the RFSW 14 is provided with a circuit for not allowing a radio frequency signal input to the second port P2 to be applied to the first port P1.

The TV module 16 operates by an input of a power supply voltage Vcc supplied upon the "turning off" of a switch 31. The TV module 16 includes a tuner 32 for selecting only a TV channel signal corresponding to an input of a tuning signal CH-S from the signal input to the first port P1 to down-convert the TV channel signal to an intermediate frequency signal IF,

and a demodulator 36 for demodulating the intermediate frequency signal IF output from the tuner 32 to output a composite video signal CV, a composite synchronizing signal CSYNC and an audio signal AO2. The tuner 32 includes a Phase-Locked Loop 34 for generating an associated tuning frequency in response to an input of the tuning signal CH-S, determining whether or not a phase is locked to the generated tuning signal, and outputting a receiving state signal RSS corresponding to a receiving field strength of the TV channel signal received.

The TV control section 22 includes a flash memory (FRAM) 38 for storing program data for controlling the TV module 16, font data and graphic data such as an icon; a video memory (VRAM) 40 for storing a text data and the graphic data under the predetermined control to output them as display images; a display control section 42 for inputting and analyzing data in response to an input of an interrupt signal INT, accessing the flash memory 38 and outputting the tuning signal TS, the text data and the graphic data corresponding to the analysis of the data from the flash memory 38, and controlling the tuning operation according to the receiving state signal RSS outputted from the TV module 16; an OSD processor 44 disposed between the MSP 20 and the display control section 42, for interfacing data therebetween and synchronizing the display related data outputted from the display control section 42 with a vertical synchronizing signal and horizontal synchronizing signal output

from the LCDD 24 to output the synchronized display related data as display images through the video memory 40. The display control section 42 has an 8 bit-microprocessor MPU of one chip and a UART for communication of data included therein. Further, the OSD processor 44 includes a timing generator for generating a pseudo composite synchronizing signal therein, and a latch register for temporarily storing data, etc. The pseudo composite synchronizing signal is used when displaying the OSD data associated with the phone mode on the TFT-LCD 26 in a state in which the TV module is disabled.

Now, the operation of the TV phone according to the present invention will be described in detail hereinafter with reference to figure 1.

First of all, suppose that the operation mode of the TV phone is set to a TV mode as shown in figure 1 and one incoming mode selected from first, second and third incoming modes is set as an alarm mode for an incoming call of the TV phone. For example, suppose that at least one of the three incoming call modes includes a first incoming call mode for interrupting power supply to the TV and switching operational mode from a TV mode to a phone mode, a second incoming call mode for switching a TV audio output from the TV module, and/or a third incoming call mode for displaying an incoming call character message or a preset graphic at a specific region on a TV image displaying screen is set as the incoming call alarm mode. Such an

incoming call mode is set in such a fashion that using a key matrix 30 as shown in Figure 1 sets the incoming call mode in the phone mode. For example, the first incoming call mode is a phone mode, the second incoming call mode is a bell mode, and the third incoming call mode is a mute or lamp mode, and these incoming call modes are automatically set.

As shown in Figure 1, a radio-frequency, electromagnetic signal is received by an antenna 12 which converts the radio-frequency, electromagnetic signal into an electrical signal which is supplied to a common terminal COM of an RFSW 14. The RFSW 14 allows the common terminal COM to be connected to the first port P1 and the second port P2 based on a logic level of a control signal output from the MSP 20 or to be connected to the second port P2. For example, when the operational mode of the TV phone is set to a TV mode, the MSP 20 enables a power supply control signal TVCTL to "turn on" a switch 31 shown in Figure 1 and makes the control signal IDLE become a logic "high" state. By this operation, when the switch 31 is turned on, the TV module 16 is supplied with a power supply voltage Vcc so that it is in an operable state.

In such a state, the MSP 20 supplies the OSD processor 44 in the TV control section 22 with a channel selection signal input from the key matrix 30 or a channel selection command signal CHS for selecting a channel which allows a user to view a TV program. The OSD processor 44 stores the channel

selection command signal CHS input from the MSP 20 in a latch register 46 included therein and generates an interrupt signal INT. The display control section 42 reads out data stored in the latch register 46 included in the OSD processor 44 and analyzes it to determine if the interrupt signal INT is a command or general data in response to activation of the interrupt signal INT. Determining whether a specific address bit or data bit transmitted from the MSP 20 is set performs this analysis. At this time, the display control section 42 outputs a response signal ACK in response to activation of the interrupt signal INT to release an interrupt of the OSD processor 44. By this release of the interrupt, the OSD processor 44 sets a state of its latch register 46 to a free state.

By this operation, if the display control section 42 determines that data input from the OSD processor 44 is the channel selection command signal CHS, it accesses the flash memory 38 and outputs a tuning signal TS corresponding to the channel selection command signal CHS from the flash memory 38 for application to a PLL 34 of a tuner 32 disposed in the TV module 16.

The PLL 32 in the TV module 16 generates a tuning frequency corresponding to the tuning signal for application to the TV tuner 32, which down-converts an associated TV channel signal from among the radio-frequency electromagnetic signals

output from the first port P1 of the RFSW 14 to an intermediate frequency signal IF for application to the demodulator 36.

The demodulator 36 connected to the tuner 32 is adapted to demodulate the intermediate frequency signal IF to output a composite video signal CV, a composite synchronizing signal CSYNC and audio signal AO2 of the associated channel. The audio signal output from the demodulator 36 is reproduced through a speaker (not shown) for outputting an audible sound by turning on of the switch 33 or an ear phone (not shown). The PLL 34 of the tuner 32 ensures that an oscillating frequency of a voltage controlled oscillator VCO is locked, and measures a receiving field strength of the selected channel to supply the receiving state signal RSS corresponding to the measured field strength to the display control section 42. The display control section 42 allows for an automatic channel search using a voltage level of the receiving state signal RSS.

Meanwhile, the LCDD 24 allows a decoder such as, for example, an NTSC or other decoder, included therein to separate the analog composite video signal CV into a color signal of R, G, and B, and synchronizes the separated color signal of R, G, and B with the composite synchronizing signal CSYNC for application to a TFT-LCD 26, which displays the synchronized color signal on a screen thereof. Also, the LCDD 24 synchronizes and separates the composite synchronizing signal CSYNC input thereto to output a vertical synchronizing signal

VS and a horizontal synchronizing signal HS. Therefore, when the operational mode of the TV phone is set to a TV mode, TV images are displayed on a screen of the TFT-LCD 26 while an audio signal AO2 is externally output under the control of the MSP 20.

Meanwhile, the MRFU 16 coupled to the antenna 12 receives a radio-frequency, electromagnetic signal of a transmitting/receiving frequency bandwidth for a portable phone, converts an analog signal into a digital signal or converts a digital signal into an analog signal, and power-amplifies the converted signal to transmit it through the antenna 12. The MRFU 32 can be constructed by combining an RF unit and a baseband analogue circuit of a conventional portable phone. For example, the MRFU 32 can be embodied by combining a CDMA type radio transceiver unit, a chip of "BBA2.X(Q5312CDMA)" manufactured by "QUALCOMM. Co." as a BBA circuit for converting an analog signal into a CDMA type digital data and vice versa, and an RF unit. At this time, the RFSW 14 allows the common terminal COM to be connected automatically to the second port P2 under the control of the MSP 20 as described above when the operational mode of the MRFU 18 is changed from a wait mode to a transmitting/receiving mode.

The MSP 20 coupled to the MRFU 18 analyzes commands supplied from the key matrix 30 and generates control signals corresponding to the commands. Further, the MSP 20 performs

data signal processing operations such as demodulating, de-interleaving, decoding, and vocoding of the digital signal input thereto from the MRFU 18 so that it outputs the received forward channel data while outputting a coded audio data as a reverse channel data. A codec 28 coupled to the MSP 20 converts the coded audio data to an analog audio signal to output the converted audio signal through a speaker or earphone, or codes an analog audio signal input thereto from a microphone to supply the coded audio signal as an audio signal of a backward data to the MSP 20.

In addition, the MSP 30 informs a user watching a TV program of the reception state of an incoming call from the calling party by controlling the incoming call modes as shown in figure 3a and 3b through analysis of the incoming call alarm modes set in an inner memory if the received forward channel data message is a message associated with an incoming call. The MSP 30 may selectively use "MSM2300" of a one-chip type supplied from "QUALCOMM Co." in U.S.A. and one of chips for executing the same function as that of the "MSM2300" chip.

Figure 2 is a flowchart illustrating the process of displaying an incoming call message of the TV phone according to a preferred embodiment of the present invention, in which the operational mode of the TV phone of figure 1 is switched from a TV mode to a phone mode and a user is informed of an incoming call state upon the reception of an incoming call

message in the TV mode. A program for the flowchart is masked in a memory block of the MSP 30 as shown in figure 1.

Figures 3a and 3b illustrate schematically examples of a state in which the incoming call message is displayed on a viewing screen of a display unit of the TV phone according to a preferred embodiment of the present invention, in which figure3a illustrates a character message, signifying an incoming call, displayed on a specific region of a viewing screen of the display unit, for example, at the lower end portion, and figure 3b illustrates a preset graphic image including an image character message of "you're wanted on the phone" displayed on the entire portion of the viewing screen thereof.

A mode switching operation from a TV mode to a phone mode upon the occurrence of an incoming call will be described in detail hereinafter with reference to figure 2 and figures 3a and 3b.

Referring now to figure 2, in a state in which a user watches the TV program of a desired channel of the TV phone in a TV mode, the MSP 20 monitors an output of the MRFU 18 at a predetermined period and determines at step 102 whether or not any incoming call message has been received. If it is determined at step 102 that any message associated with an incoming call has not been received, the MSP 20 continues to

operate in the TV mode.

On the other hand, if it is determined at step 102 that the MRFU 18 has received any message associated with an incoming call, the program proceeds to step 104 at which the MSP 30 detects the incoming call alarm modes set in the memory therein. The incoming call alarm modes herein means the above-mentioned first, second and third incoming call modes. The MSP 20 determines at steps 106, 110 and 114 of figure 2 whether or not a present incoming call mode is any one of the first to third incoming call modes. If it is determined at step 106 that the present incoming call mode is the first incoming call mode (i.e., a bell mode), the program proceeds to step 108 at which the MSP 20 disables a power supply control signal TVCTL supplied to the switch 31 so that it interrupts a power supply voltage supplied to the TV module 16 while making the control signal IDLE supplied to the RFSW 14 therefrom become a logic "low" state, which allows the antenna 12 to be connected to the second port P2 of the RFSW 14. Such a state is a state in which a telephone bell is driven by a call of a calling party. If it is determined at step 120 that a user has responded to the incoming call from the calling party, the program proceeds to step 122 in which the MSP 20 transmits a response message through a reverse channel.

If it is determined at step 110 that the present incoming call mode is the second incoming call mode (i.e., a vibration

mode), the program proceeds to step 112 at which the MSP 20 switches the switch 33 connected to an audio output node of the demodulator 36 at a predetermined period to switch an output of a TV audio signal. Therefore, when an incoming call mode is set to the second incoming call mode, the audio signal that accompanies the TV image is temporarily interrupted even though the TV image continues to be output, thereby informing audibly a user viewing the TV program of an incoming call state.

If it is determined at steps 106 and 110 that the present incoming call mode is not set to the first or second incoming call mode, the program proceeds to step 114 where the MSP 20 decides that it is in the third incoming call mode and determines whether or not the present incoming call mode is set to the text mode. The text mode herein is intended to display an incoming call message at the lower end portion of the viewing screen like an oblique line as shown in Figure 3a. If it is determined at step 114 that the present incoming call mode is set to the third incoming call mode, the program proceeds to step 116 where the MSP 20 supplies the OSD processor 44 with a control signal signifying a text. At this time, the OSD processor 44 generates the interrupt signal INT in response to the control signal signifying text output from the MSP 20 for application to the display control section 42. The display control section 42 analyzes the control signal signifying text stored in the latch register 46 of the OSD processor 44 and accesses the flash memory 38 to allow the

flash memory 38 to output text data corresponding to the text signifying control signal for application to the OSD processor 44. The processor 44 stores the text data input thereto from the display control section 42 in the video memory 40. Also, the OSD processor 44 synchronizes the text data stored in the video memory 40 with the composite synchronizing signal SCYNC to output the synchronized signal as a video signal of RGB at the lower end portion of a horizontal line. The LCDD 24, which is coupled to the OSD processor 44, supplies the video signal of RGB output from the OSD processor 44 to the TFT-LCD 26, which displays the video signal at the lower end portion of a image viewing screen as shown in Figure 3a.

It should be noted that the display control section 42 and the OSD processor 44 controls the text data so that they can be displayed at the lower end portion of a field or a frame as described above. In addition, it is preferable that the text data is an image character message of "you're wanted on the phone". The oblique line portion as shown in Figure 3a is a region in which any message notifying reception of an incoming call is displayed, and the remaining portion, except the oblique line portion, is a region on which TV images are displayed.

If, on the other hand, it is determined at step 114 that the present incoming call mode is not set to the third incoming call mode, the program proceeds to step 118 where the MSP 20

transmits a graphic data displaying command to the display control section 42 through the OSD processor 44. The display control section 42 accesses the flash memory 38 and allows the flash memory 38 to output the graphic data for graphically displaying an incoming call state in response to the graphic data displaying command for application to the OSD processor 44, which stores the input graphic data in the video memory 40. The OSD processor 44 synchronizes the graphic data stored in the video memory 40 with the composite synchronizing signal SCYNC to output the synchronized signal as a video signal of RGB at the lower end portion of a horizontal line. The LCDD 24, which is coupled to the OSD processor 44, supplies the video signal of RGB outputted from the OSD processor 44 to the TFT-LCD 26, which displays an image in which the graphic data is superimposed on a image viewing screen of a field or a frame as shown in figure 3b.

Accordingly, it can be seen that if the incoming call alarm mode is set to the third incoming call mode, either a character message signifying the incoming call or images signifying the incoming call in which the telephone graphic and the image character message of "you're wanted on the phone" are combined, is displayed either at the lower end portion of the image viewing screen or the entire portion of the image viewing screen in a state in which a TV audio sound is reproduced and outputted, thereby informing a user of an incoming call state.

At a subsequent step 120, the MSP 20 determines whether or not a user has responded to the incoming call. This can be implemented by detecting if a signal corresponding to input of a SEND key arranged on the key matrix 30 is generated. For a flip type portable phone, the response to the incoming call can be detected through the opening of a flip of the portable phone. If it is determined at step 120 that the user responds to the incoming call, the program proceeds to step 122 at which the MSP 20 transmits an incoming call response message through the MRFU 16 to a base station to enter a phone mode. On the other hand, if is determined at step 120 that the user does not respond to the incoming call, the operational mode of the TV phone returns to the TV mode.

Table 1 below provides a summary of the operational modes of a TV phone according to an embodiment of the present invention.

			Phone			
Idel State	Operation Mode	Operation of RFSW	Tranmission	Reception	TV	Explanation
Low	Phone mode	COM→P2 connection	On	Off	Off	Reception waiting state
Low	Phone mode	COM→P2 connection	On	On	On	Communication state (reception and transmission start)
High	TV mode	COM→P1 & P2 connection	On	Off	Off	The TV and the phone receive electric wave. This operation can be realised by virtue of a filter between COM and P2 in the RFSW

As is apparent from the above description, the TV phone of the present invention provides an advantage in that a user is informed of reception of an incoming call by stopping the operation of a TV module, switching off and on output of an audio signal of a selected TV broadcasting channel upon the reception of the incoming call in a TV mode, or displaying a character message signifying an incoming call at the lower end portion of an image on a viewing screen of a selected TV channel, thereby accurately informing a user of the reception state of the incoming call and allowing the user to rapidly speak by telephone in a state in which a user watches any TV

program in a TV mode.

While this invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not limited to the disclosed embodiment, but, on the contrary, it is intended to cover various modifications within the spirit and scope of the appended claims.

CLAIMS

1. A TV phone in which a television and a portable cellular phone are integrally combined, the TV phone comprising:

a TV module for receiving and demodulating a desired TV channel signal selected from received radio-frequency electromagnetic signals in response to input of a tuning signal when the TV module operates by supply of a power supply voltage, to generate a composite video signal, a composite synchronizing signal and a composite audio signal;

a Mobile Station Radio Frequency Unit (MRFU) for demodulating a signal indicative of an incoming call received through a forward channel for forming an audio conversion channel of the received radio-frequency electromagnetic signals and to output the demodulated signal, and modulating and transmitting a signal of a reverse channel;

a TV control section for supplying the tuning signal corresponding to a channel selection command signal to the TV module, the TV control section synchronizing On Screen Display (OSD) data corresponding to display control data and display data such as an icon with the composite synchronizing signal to output the synchronized signal as a video signal;

a Mobile Station Processor (MSP) for establishing a phone mode/TV mode in response to an input command,

generating the channel selection command signal stored in a predetermined memory area by setting the TV mode, supplying the display control data to the TV control section according to a preset incoming call alarm mode when receiving an incoming signal from the MRFU or interrupting a power supply voltage supplied to the TV module, and processing audio data outputted from the MRFU to output the processed audio data signal while supplying an audio data inputted to the MRFU; and

a display unit for synchronizing the composite video signal and graphic video signal output from the TV module and the TV control section with the composite synchronizing signal and displaying the synchronized composite video signal and graphic video signal on a image viewing screen.

2. A TV phone as claimed in claim 1, further comprising a power switch disposed between the TV module and a power supply unit, the power switch being switched under the control of the MSP to turn on/off the TV module.

3. A TV phone as claimed in either of claims 1 or 2, further comprising an antenna for receiving or transmitting a radio-frequency, electromagnetic signal; and a Radio Frequency Switch (RFSW) disposed between the TV module and the MFRU, the RFSW allowing the antenna to be connected to the TV module and the MRFU in response to

the establishment of a TV mode of the MSP, and allowing the antenna to be connected to only the MRFU in response to the establishment of a TV mode of the MSP.

4. A TV phone as claimed in any preceding claim, wherein in a TV mode allowing for viewing of a TV image, an incoming call alarm mode of the TV phone in the MSP upon reception of an incoming call comprises one of a first incoming call mode for interrupting a power supply voltage supplied to the TV module and switching an operational mode of the TV phone from a TV mode to a phone mode, a second incoming call mode for switching off/on, at or for a predetermined period, only a TV audio signal output from the TV module, and a third incoming call mode for displaying an incoming call character message or a preset graphic message at a specific region or an entire portion of a TV image viewing screen, and the MSP controls selectively the power switch, the audio output switch or the TV control section based on a preset incoming call mode selected from among the first to the third incoming call modes in response to reception of an incoming call.

5. A TV phone substantially as described herein with reference to and/or as illustrated in the accompanying drawings.

The Patent Office

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Application No: GB 9930043.6
Claims searched: 1-5

Examiner: John Betts
Date of search: 16 June 2000

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): H4L (LDA, LDSC) H4F (FAAX) H4J (JAAB) H4K (KFH)

Int Cl (Ed.7): H04M 11/08 H04N 5/445 H04M 1/21

Other: On-line: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB2285553 A	(Guest)	
A	DE3216197 A	(Siemens)	
A	US4427847	(Zenith)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.